Inventory of vegetation structure and phenology at Kulm Wetland Management District

FY13

PROJECT DESCRIPTION

Because structure of vegetation, especially height-density, and the presence or absence of a litter layer are the major factors that influence nest-site selection for upland-nesting migratory birds (Kantrud and Higgins 1992), it is critical that managers understand how management treatments can impact vegetation structure that breeding migratory birds rely upon. However, no information exists that describes vegetation structure on waterfowl production areas (WPAs) during the primary nesting season (late April through mid-July) for waterfowl and other upland nesting migratory birds at Kulm Wetland Management District (WMD). The Kulm WMD habitat management planning team has selected a group of focal species that have a range of nesting habitat requirements. Managers strive to maintain a mosaic of vegetation structure on WPAs during the nesting season to fulfill these requirements (i.e., mean visual obstruction range of 5.5-[marbled godwit] to 37.7-in [northern harrier]; Laubhan et al. 2006). To ensure that Kulm WMD meets its legally mandated purpose of providing habitat for the production of waterfowl and other migratory birds, it is imperative that managers have empirical data that describes vegetation structure during the nesting period to support science-based management decisions that benefits these species.

The purpose of our study was to conduct a baseline inventory of vegetation structure and record phenological changes in vegetation on upland habitat types including native prairie, low-diversity reconstructed prairie, and seeded introduced grasses that have received a range of defoliation treatments (principally grazing and fire). This information will be used as a tool to help guide future management of uplands by avoiding generic management prescriptions and focusing on implementing management based on absolute measures of vegetation structure required by focal species and during identified management periods to enhance native prairie.

OBJECTIVES AND ALTERNATIVES

The objectives of this study were to: 1) inventory vegetation structure on upland habitat types including native prairie, reconstructed prairie, and seeded introduced grasslands during the primary nesting period (approximately 23 April – July 15) for migratory birds, 2) document phenological changes in vegetation on upland habitat types that can be used to implement treatments to control invasive cool-season grasses (smooth brome [*Bromus inermis*] and Kentucky bluegrass [*Poa pratensis*] and 3) improve the conservation delivery of defoliation treatments on Kulm WMD to better meet focal species habitat requirements identified in the Kulm WMD HMP.

METHODS AND PROTOCOLS

This inventory was the second year of a multi-year project that recorded phenological changes in vegetation structure (height-density, growth form) at randomly generated points by collecting specific vegetation measurements at weekly intervals for 10 weeks (6 May – 12 July) on native prairie, low-diversity reconstructed prairie (6-10 grass species), and DNC habitat types. We were not able to begin the inventory in mid-April in 2013 because sequestration delayed hiring staff until early May. Sample points were randomly generated using ArcGIS software (version 10) using the following criteria: 1) located in target habitat type, 2) ≥50-

m from roads, and 3) located ≥25 m apart to maintain independence among points.

We only selected tracts within WPAs that were not managed in the current management year (1 Sept 2012 – 31 Aug 2013) to remove any confounding effects of defoliation on measurements collected at each point. We were not able to equally distribute the number of points based on the frequency of previous defoliation treatments (i.e., # years since last treatment) within each habitat type because most WPAs were managed (i.e., grazed or burned) during the current management year which limited the number of units that we could include in the study. All DNC sites included in the study was considered "old" (≥15 years since planting) and all reconstructed prairie sites were considered established (≥7 years since planting). We measured visual obstruction (VOR) and vegetation height to the nearest inch using a modified Robel pole (Robel 1970, Benkobi et al. 2000). Litter depth (mm) was measured directly by lowering a meter stick vertically into the litter layer until contact with soil substrate is obtained at each sample point. Litter was considered accumulated horizontal dead vegetation forming a mat-like layer, roughly continuous to the ground (Madden et al. 2000). Maximum vegetation height was measured as the tallest vegetation within 4-m of the Robel pole. We recorded vegetation canopy cover categorized in 7 classes by percent (0 = no cover, 1 = 1–5%, 2 = 6–25%, 3 = 26–50%, 4 = 51–75%, 5 = 76–95%, 6 = 96–100%) for grasses, forbs, shrubs, live cover, standing dead cover, litter, and bare ground following Daubenmire (1959). Ocular estimates of average phenological stage of smooth brome (leaf stage, percent having an inflorescence), Kentucky bluegrass (percent having an inflorescence), and native cool-season grasses (percent having an inflorescence) were collected within a 1-m^2 area centered around the Robel pole. Slope and aspect for each sample point also was recorded.

DATA ANALYSIS / MODELS

Data analyses described below will be competed following the 2014 field season when the study is completed.

We will use ANOVA to test for differences between habitat types for vegetation metrics. We also will use ANOVA with repeated measures to test for weekly vegetation differences within habitat types; a Bonferroni correction factor to maintain alpha when multiple tests were performed.

We will evaluate collinearity between vegetation metrics (visual obstruction of vegetation, average height of vegetation, maximum vegetation height, percent live vegetation, smooth brome leaf stage, smooth brome inflorescence, Kentucky bluegrass inflorescence, native cool-season inflorescence using Pearson's correlation coefficient ($|r| > 0.50$) to identify phenological trends. Statistical test were conducted using SPSS version 19 (SPSS 2011) with an experiment-wide error rate of $\alpha = 0.05$.

DATA MANAGEMENT

The Biologist at Kulm WMD will act as the data steward and comply with the FWS policy on data resource management (274 FW 1) by complying with data management standards to ensure quality control procedures and security considerations while creating, maintaining, and storing data in accordance with FWS policies 274 FW 2 and 282 FW 4. Software used to store data for the project will include: 1) Program R, SAS, and/or SPSS Statistics 19, 2) Microsoft Excel spreadsheets, and 3) GIS spatial data in ArcMap 10.

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PARTNERS

Over 6 people have been involved in the project representing the U.S. Fish and Wildlife Service and South Dakota State University.

SOURCES OF SUPPORT

FY13 I&M contribution: ***$18,386***

- We used funds from this project to hire 1 USFWS technician and 3 biological technicians under a cooperative agreement between Kulm WMD and South Dakota State University.

Kulm WMD contribution: approx. $2,787.20 (Fuel) + $1,000 (Equipment/Vehicles) = ***$3,787.20***

CURRENT STATUS

We measured vegetation on 2,054 points located on 9 WPAs (3 native prairie, 3 reconstructed prairie, 3 DNC) indicate that mean vegetation density (VOR) significantly differed among habitat types ($F_{2,\ 2051} = 11.92$, $P < 0.001$) and peaked at approximately 26 June for native prairie ($\bar{x} = 11.81$ in, SE = 0.62), 7 July for low-diversity reconstructed prairie ($\bar{x} = 11.45$, SE = 0.57), and 26 June for DNC ($\bar{x} = 13.07$, SE = 0.76; Figure 1). Average 5-leaf stage for smooth brome was maintained after 12 June for native prairie, 12 June for reconstructed prairie, and 12 June for DNC (Figure 2).

A detailed analysis will be completed following the third year (2014) of this study. A manuscript will then be submitted for acceptance in a peer-reviewed journal. We will provide a copy of the manuscript to the Regional I&M coordinator and Dakotas Zone Biologist at that time.

Vegetation Structure – Preliminary information gathered during the first two years of this study indicate that there is significant variation between years and within habitat types located in geographically similar areas (i.e., Kulm WMD). However, additional information collected during the final year will be critical to estimate trends in habitat types across years. This information will be discussed in detail in the manuscript submitted for publication following the final year of this study.

Phenology – Appropriate timing of defoliation treatments is important when managers desire to restore invaded native prairie tracts. We identified preliminary management windows to control invasive grasses during the first two years of the study. We will provide an extensive discussion on the phenology of cool-season grasses in the final manuscript focused on identifying management windows to control smooth brome and Kentucky bluegrass in the central mixed-grass prairie ecosystem.

CHALLENGES

We were not able to begin the inventory in mid-April as proposed because sequestration delayed hiring staff until early May in 2013.

MORE INFORMATION

1) A final report will be submitted in the form of a peer-reviewed manuscript following the completion of the final year (2014) of this project.

2) This project will provide essential baseline information needed to support multiple HMP goals and objectives. Data from this 3-year study will be the

foundation for implementing effective management strategies in the central portion of the mixed-grass prairie ecosystem aimed at: 1) meeting the microsite habitat requirements for nesting focal species identified in the HMP, and 2) identifying specific "management windows" to enhance degraded native prairie based on the phenology of invasive cool-season grasses (smooth brome [*Bromus inermis*] and Kentucky bluegrass [*Poa pratensis*]).

CONTACT INFORMATION

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LITERATURE CITED

Benkobi, L., D. W. Uresk, G. Schenbeck, and R. M. King. 2000. Protocol for monitoring standing crop in grasslands using visual obstruction. Journal of Range Management 53:627–633.

Daubenmire, R. F. 1959. A canopy-coverage method of vegetation analysis. Northwest Science 33:521–524.

Devries, J. H. and L. M Amstrong. 2011. Impact of management treatments on waterfowl use of dense nesting cover in the Canadian Parklands. Journal of Wildlife Management 75:1340-1349.

Engle, D. M.; Bultsma, P. M. 1984. Burning of northern mixed prairie during drought. Journal of Range Management. 37(5): 398-401.

Kantrud, H. A., and K. F. Higgins. 1992. Nest and nest-site characteristics of some ground-nesting, non-passerine birds of northern grasslands. The Prairie Naturalist 24:67-84.

Laubhan, M. K., R. A. Gleason, G. A. Knutsen, R. A. Laubhan, and N. H. Euliss, Jr. 2006. A preliminary biological assessment of Long Lake National Wildlife Refuge Complex, North Dakota. U.S. Department of Interior, Fish and Wildlife Service, Biological Technical Publication, BTP R6006-2006, Washington, D.C.

Madden, E. M., R. K. Murphy, A. J. Hansen, and L. Murray. Models for guiding management of prairie bird habitat in northwestern North Dakota. American Midland Naturalist 144:377-392.

Robel, R. J., J. N. Briggs, A. D. Dayton, and L. C. Hulbert. 1970. Relationships between visual obstruction measurements and weight of grassland vegetation. Journal of Range Management 23:295–297.

SPSS. 2011. Basic Statistics. SPSS Inc., Chicago, Illinois, USA.

Wilson, G. D., and J. Stubbendieck. 2000. A provisional model for smooth brome management in degraded tallgrass

prairie. Ecological Restoration 18:34-38.

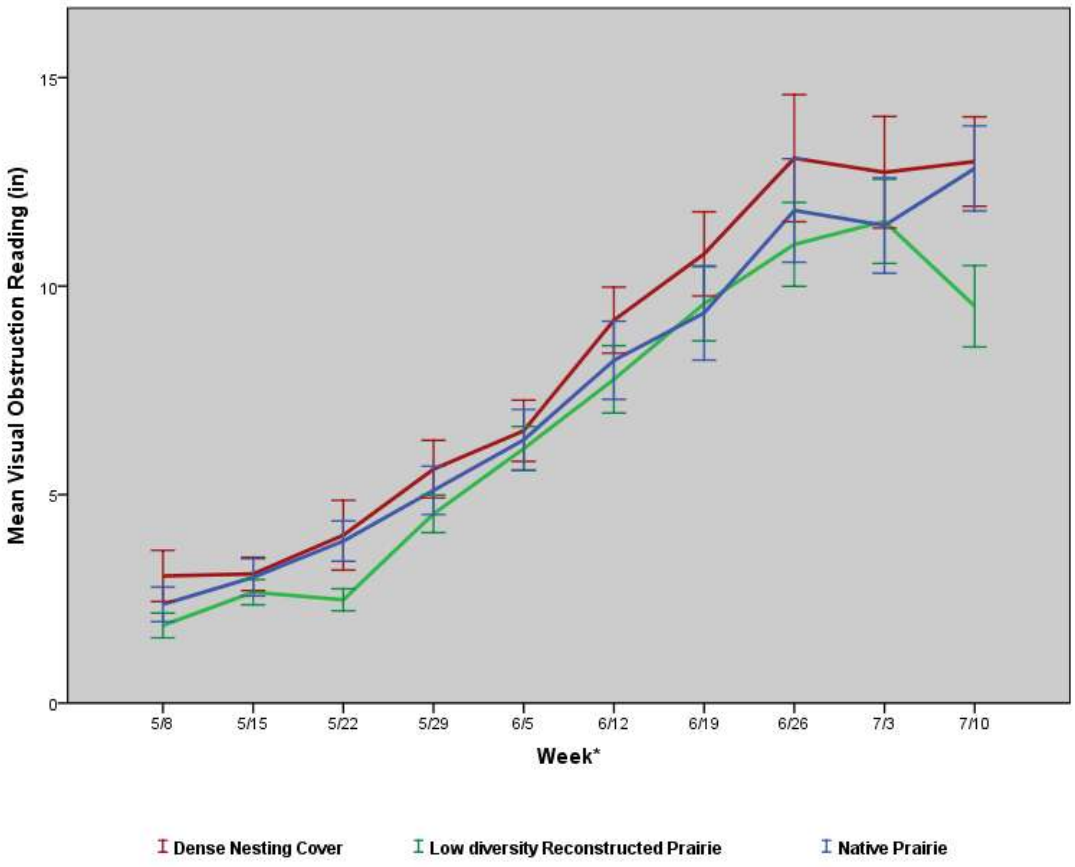

Figure 1. Mean visual obstruction reading (in) on native prairie, low-diversity reconstructed prairie, and dense nesting cover habitat types during the primary nesting period for migratory birds on waterfowl production areas in the Kulm Wetland Management District in south central North Dakota. *95% CIs presented at the midpoint for each week.

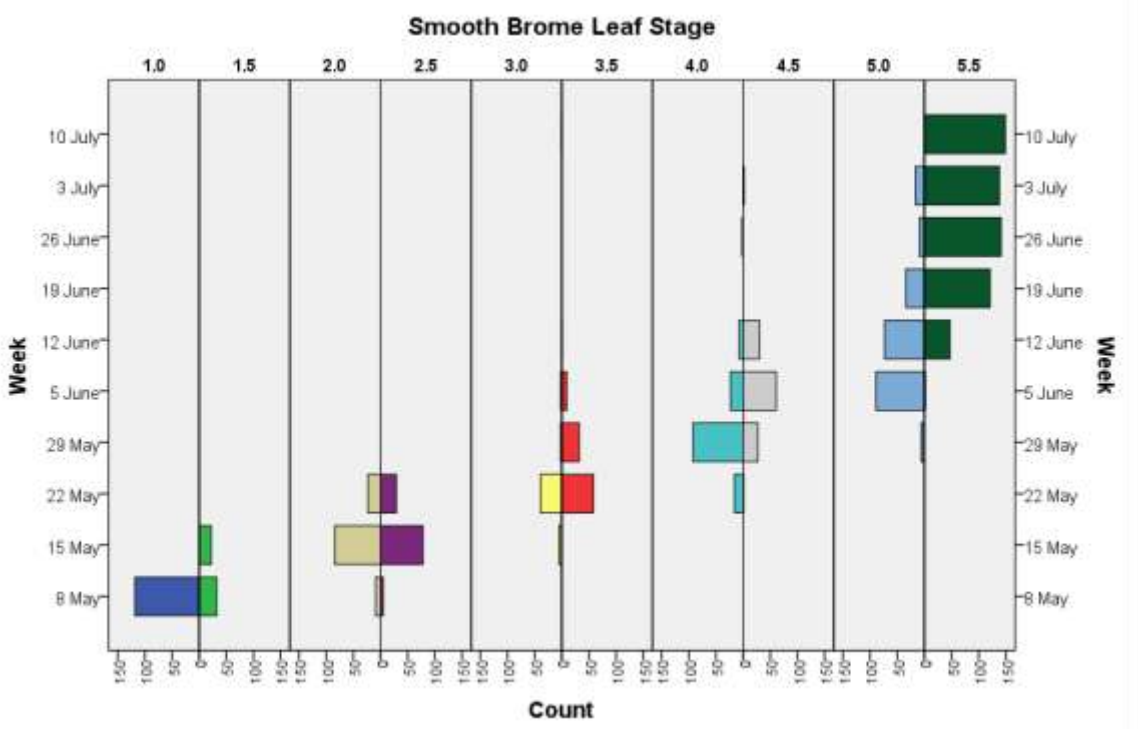

Figure 2. Timing of smooth brome (*Bromus inermis)* leaf stage development pooled across grassland habitat types (native prairie, low-diversity reconstructed prairie, dense nesting cover) located on waterfowl production areas in the Kulm Wetland Management District, North Dakota during 2013. Count represents actual leaf stage measurements at each point at the midpoint for each week.